

WHAT IS CLAIMED IS:

1                   1. A method for controlling at least one engine cooling fan for a  
2 compression ignition internal combustion, the method comprising:  
3                   turning on the at least one cooling fan when an intake manifold air  
4 temperature is equal to or greater than a predetermined turn-on threshold  
5 temperature for a predetermined turn-on time; and  
6                   turning off the at least one cooling fan when the intake manifold air  
7 temperature is equal to or less than a predetermined turn-off threshold temperature  
8 for a predetermined turn-off time, wherein the predetermined turn-on threshold  
9 temperature is greater than the predetermined turn-off threshold temperature.

1                   2. The method of claim 1 further comprising determining the  
2 predetermined turn-on time and the predetermined turn-off time via a look up table  
3 and in response to the intake manifold air temperature.

1                   3. The method of claim 1 further comprising turning off the at least  
2 one cooling fan when an engine coolant temperature is below a predetermined  
3 temperature.

1                   4. The method of claim 3 further comprising turning off the at least  
2 one cooling fan when both of the intake manifold air temperature and the engine  
3 coolant temperature are equal to or less than respective predetermined temperatures  
4 when the intake manifold air and engine coolant temperatures are independent of one  
5 another.

1                   5. The method of claim 1 further comprising turning on the at least  
2 one cooling fan when a final torque generated by the engine is equal to or greater  
3 than a predetermined value.

1                   6. The method of claim 1 further comprising delaying turn-on of the  
2 at least one fan when the engine is attempting to start or within 5 seconds after  
3 starting.

1                   7. The method of claim 1 further comprising determining the  
2 predetermined turn-on time and the predetermined turn-off time using a counter.

1                   8. The method of claim 1 further comprising turning on the at least  
2 one fan when there is a fault in at least one sensor related to determination of the  
3 intake manifold air temperature.

1                   9. The method of claim 1 further comprising:  
2                   turning on a low speed one of the at least one fans when the air inlet  
3 temperature is equal to or greater than a predetermined low turn-on threshold  
4 temperature for a predetermined low turn-on time;  
5                   turning off the low speed fan when the intake manifold air  
6 temperature is equal to or less than a predetermined low turn-off threshold  
7 temperature for a predetermined low turn-off time, wherein the predetermined low  
8 turn-on threshold temperature is greater than the predetermined low turn-off  
9 threshold temperature;  
10                  turning on a high speed one of the at least one fans when the air inlet  
11 temperature is equal to or greater than a predetermined high turn-on threshold  
12 temperature for a predetermined high turn-on time; and  
13                  turning off the high speed fan when the intake manifold air  
14 temperature is equal to or less than a predetermined high turn-off threshold  
15 temperature for a predetermined high turn-off time, wherein the predetermined high  
16 turn-on threshold temperature is greater than the predetermined high turn-off  
17 threshold temperature and the predetermined high turn-on threshold temperature is  
18 greater than the predetermined low turn-on threshold temperature.

1                   10. The method of claim 9 further comprising transitioning off the  
2 high speed fan when the intake manifold air temperature is equal to or less than the  
3 predetermined high turn-off threshold temperature plus a low offset value for the  
4 predetermined high turn-off time.

1                    11. A system for controlling at least one cooling fan for a  
2 compression ignition internal combustion engine, the system comprising:  
3                    at least one sensor for providing an indication of at least one engine  
4 component parameter; and  
5                    an engine controller in communication with the at least one engine  
6 component parameter sensor, the engine controller configured to,  
7                    turn on the at least one cooling fan when an intake manifold  
8 air temperature is equal to or greater than a predetermined turn-on threshold  
9 temperature for a predetermined turn-on time; and  
10                   turn off the at least one cooling fan when the intake manifold  
11 air temperature is equal to or less than a predetermined turn-off threshold  
12 temperature for a predetermined turn-off time, wherein the predetermined  
13 turn-on threshold temperature is greater than the predetermined turn-off  
14 threshold temperature.

1                    12. The system of claim 11 wherein the controller is further  
2 configured to determine the predetermined turn-on time and the predetermined turn-  
3 off time via a look up table and in response to the intake manifold air temperature.

1                    13. The system of claim 11 wherein the controller is further  
2 configured to turn off the at least one cooling fan when an engine coolant  
3 temperature is below a predetermined temperature.

1                    14. The system of claim 13 wherein the controller is further  
2 configured to turn off the at least one cooling fan when both of the intake manifold  
3 air temperature and the engine coolant temperature are equal to or less than  
4 respective predetermined temperatures when the intake manifold air and engine  
5 coolant temperatures are independent of one another.

1                    15. The system of claim 14 wherein the controller is further  
2 configured to turning on the at least one cooling fan when a final torque generated  
3 by the engine is equal to or greater than a predetermined value.

1                   16. The system of claim 11 wherein the controller is further  
2 configured to delay turning on the at least one fan when the engine is attempting to  
3 start or within 5 seconds after starting.

1                   17. The system of claim 11 wherein the controller is further  
2 configured to determine the predetermined turn-on time and the predetermined turn-  
3 off time using a counter.

1                   18. The system of claim 11 wherein the controller is further  
2 configured to turn on the at least one fan when there is a fault in at least one sensor  
3 related to determination of the intake manifold air temperature.

1                   19. The system of claim 11 wherein the controller is further  
2 configured to:  
3                   turn on a low speed one of the at least one fans when the air inlet  
4 temperature is equal to or greater than a predetermined low turn-on threshold  
5 temperature for a predetermined low turn-on time;  
6                   turn off the low speed fan when the intake manifold air temperature  
7 is equal to or less than a predetermined low turn-off threshold temperature for a  
8 predetermined low turn-off time, wherein the predetermined low turn-on threshold  
9 temperature is greater than the predetermined low turn-off threshold temperature;  
10                  turn on a high speed one of the at least one fans when the air inlet  
11 temperature is equal to or greater than a predetermined high turn-on threshold  
12 temperature for a predetermined high turn-on time; and  
13                  turn off the high speed fan when the intake manifold air temperature  
14 is equal to or less than a predetermined high turn-off threshold temperature for a  
15 predetermined high turn-off time, wherein the predetermined high turn-on threshold  
16 temperature is greater than the predetermined high turn-off threshold temperature  
17 and the predetermined high turn-on threshold temperature is greater than the  
18 predetermined low turn-on threshold temperature.

1                   20. The system of claim 11 wherein the controller is further  
2 configured to transition off the high speed fan when the intake manifold air

- 3 temperature is equal to or less than the predetermined high turn-off threshold
- 4 temperature plus a low offset value for the predetermined high turn-off time.